Appendix C

Integrated Facility Earthworks Construction Cost Estimate and Overall Project Construction Schedule

(Prepared by DWR)

Introduction

The foundation materials at the integrated facility site locations are similar to those of the islands. The upper 5 to 25 feet of materials consist of peat soils and soft clays, which overly stiffer and denser interbedded sands and clays. Prior to constructing the integrated facility structures and embankments, the soft soils need to be removed and replaced with suitable materials. This will reduce problems associated with differential settlements between structural facilities and integrated facility embankments and improve the overall seismic performance of the facilities. This appendix describes the method of construction, including sheet piling installation, dewatering methods, excavation plan, and earthwork construction. Also included are construction costs to complete this work and an overall project construction schedule.

Scope of Work

1. Furnish and install sheet piling around the pumping facilities and embankment area prior to excavation.
2. Dewater the area around the pumping facilities, gate structures and embankments prior to excavation.
3. Excavate the facility and embankment areas.
4. Utilizing materials from the borrow areas, place and compact the earthwork for the facilities and embankments.
5. Furnish and install the bedding material and rip-rap for the embankments surrounding the facilities.

Cost Estimate Assumptions

1. Based on the latest information available, the ground water table is within 1 foot of the surface at Bacon Island and within 3.5 to 5 feet at Webb Tract. Predicated on this information, it will be necessary to place sheet piling and dewatering wells, 50 foot on center, around the perimeter of the embankment area prior to any excavation.
2. The Webb Tract integrated facilities will be built simultaneously, and before the Bacon Island integrated facilities.
3. Excavated material can be spread out over the islands (stockpiled) adjacent to the integrated facility embankments.
4. Docking, loading, and unloading facilities will be available at each island for handling materials and construction equipment.
5. Two crews for the sheet piling, excavation, and backfill operations.

Sequence of Integrated Facility Earthwork Construction

1. Mobilization
2. Temporary access roads
3. Install sheet piles
4. Install dewatering wells
5. Excavation
6. Place and compact backfill to mid-bay floor
7. Place and compact backfill for gates
8. Place and compact interior embankment
9. Place and compact exterior embankment
10. Place and compact for access-bridge
11. Construct permanent access roads
12. Demobilization

Method of Construction

Sheet Piling Installation

The first phase of this work will include installing the sheet piling required for dewatering during excavation and backfill work. The sheet piling will surround the entire footprint of the excavation pits as shown on Figures C-1 through C-4. The sheet piling will extend from 5 feet above existing ground level to a depth of approximately 9 to 13 feet below the bottom of the excavation pit, depending on the site conditions. The sheet piling will be flush with the existing ground at the access ramp locations. The length and depth of sheet piling required at the Webb Tract and the Bacon Island integrated facilities is summarized in Table C-2.

The sheet piling will be driven into the ground by two crews utilizing 60 ton cranes with pile driving equipment, forklifts, and each labor crew consisting of a foreman, an operating engineer, an oiler, and three pile drivers. The steel sheet piling has been estimated as sacrificial and therefore will be left in place.

Dewatering Methods

Dewatering during excavation and construction of the Integrated Facilities will consist of initially placing sheet piling approximately 40 feet beyond the outer limits of the excavation footprints. Dewatering wells will be placed on 50-foot centers between the sheet piling and the toe of the excavation pit. After excavation of the peat, drainage ditches and sump pumps will be installed adjacent to the toe of the excavation pits, which will help keep the foundation drier during initial embankment and foundation placement. The dewatering wells are shown on Figures C-1 through C-4.

It is assumed that water pumped out of the dewatering wells will not be pumped directly into the delta channels. It is likely that detention basins would need to be constructed so that sediments can settle before water is allowed to enter the delta.

Excavation Plan

The basic excavation plan for the Integrated Facilities is to remove all peat soil and soft clays that overlie the denser and stiffer inter-bedded sands and clays. The extent of the excavation at each site, as shown in Figures C-1 through C-4, is generally just outside of the foundation footprint for the embankments and concrete structures. It is not necessary to excavate the soft soils within the transition pool area. The estimated peat depth for removal varies from 5 feet around the fish screen area to 25 feet around the gate structures, pumping plant and embankments. The final layout for all the embankments surrounding the transition pool, midbay, bypass channel, and other compacted fills for structures has been developed in conjunction with the required excavation. The average existing ground elevation and the estimated elevation of the top of the denser and stiffer inter-bedded sands and clays (bottom of excavation pit) at each facility are shown in Table C-1.

Table C-1 – Integrated Facility Site Elevations

Approximate Elevations	Webb Tract		Bacon Island	
	San Joaquin R.	False River	Middle River	Santa Fe Cut
Average Existing Ground Elevation	-16	-15	-14	-9
Bottom of Excavation Pit Elevation	-32	-28	-29	-21

Large excavators, weighing in the 150,000 to 200,000 pound range, and trucks will remove the peat and place it in a stock pile area (adjacent to the integrated facility embankments) for eventual placement into the borrow area excavation pits. Access ramps of 10% grade will be constructed along the sides of the excavation to provide access for construction equipment. The excavation quantities for each integrated facility site are shown in Table C-2.

Earthwork Construction

Earthwork construction includes transporting borrow materials from stockpiles, placing, and compacting them at the integrated facility. The interior embankments are assumed to have a 35-foot wide crest with 3:1 rip-rapped side slopes. Borrow material for the embankments will come from the same borrow area utilized for embankment construction around the island perimeters. The compacted embankments will be placed up to the elevations of the facility structure foundations prior to construction of the structures. Embankment construction will then continue simultaneously with the structure construction. The embankment fill earthwork quantities for each integrated facility site are shown in Table C-2.

Quantities

The cost estimate is predicated on the calculated quantities, shown in Table C-2, for the excavation of soft materials, embankment fill, riprap bedding and riprap along the embankment slopes, and temporary sheet piling at each of the integrated facilities.

Table C-2 – Quantities for Integrated Facility Site Excavation and Earthwork

Estimated Quantities	Webb Tract		Bacon Island	
	San Joaquin R.	False River	Middle River	Santa Fe Cut
Excavation (CY)	510,000	368,000	367,000	294,000
Embankments (CY)	534,000	487,000	579,000	356,000
Riprap Bedding (CY)	22,100	21,500	21,500	19,200
Riprap (CY)	44,200	43,000	43,100	38,400
Length of Sheet Piling	4,100	3,720	3,870	3,800
Depth of Sheet Piling	35	30	35	30

Cost Estimates

Construction cost estimates for the earthworks construction at each integrated facility are provided in Table C-2. The cost estimates include the following:

1. Project mobilization and demobilization costs.
2. Project indirect costs (project staff, jobsite facilities, utilities, equipment, bonds, and insurances)
3. Labor, materials, and equipment to furnish, install, and remove dewatering wells.
4. Labor, materials, and equipment to furnish, and install sheet piling.
5. Labor, and equipment to excavate integrated facilities site.
6. Labor, and equipment to relocate, place, and compact the embankment.
7. Labor, materials, and equipment to furnish and place the rip-rap and rip-rap bedding materials.

Project Construction Scheduling

Construction schedules for island embankment construction, integrated facility embankment construction, and integrated facility structures construction were developed by URS, DWR, and CH2M Hill, respectively. DWR combined the individual schedules into one overall project construction schedule. The overall project construction schedule is attached to this Appendix.

Table C-3 – Integrated Facility Earthworks Construction Cost Estimate

Item	Total Quantity	Units	Unit Price	Amount
Webb Tract @ San Joaquin River				
Mobilization and Demobilization	1	JOB	LUMP SUM	$ 1,811,000
Dewatering	1	JOB	LUMP SUM	$ 1,305,000
Sheet Piling	1	JOB	LUMP SUM	$ 4,381,000
Excavation	510,000	CY	6.40	$ 3,264,000
Embankment	534,000	CY	9.20	$ 4,912,800
Rip Rap	70,800	TONS	39.00	$ 2,761,200
Rip Rap Bedding	35,400	TONS	32.50	$ 1,150,500
Subtotal				**$ 19,585,500**
Webb Tract @ False River				
Mobilization and Demobilization	1	JOB	LUMP SUM	$ 1,599,000
Dewatering	1	JOB	LUMP SUM	$ 1,305,000
Sheet Piling	1	JOB	LUMP SUM	$ 3,814,000
Excavation	368,000	CY	6.40	$ 2,361,600
Embankment	487,000	CY	9.20	$ 4,480,400
Rip Rap	68,700	TONS	39.00	$ 2,679,300
Rip Rap Bedding	34,400	TONS	32.50	$ 1,118,000
Subtotal				**$ 17,357,300**
Bacon Island @ Middle River				
Mobilization and Demobilization	1	JOB	LUMP SUM	$ 1,750,000
Dewatering	1	JOB	LUMP SUM	$ 1,305,000
Sheet Piling	1	JOB	LUMP SUM	$ 4,436,000
Excavation	367,000	CY	6.40	$ 2,348,800
Embankment	579,000	CY	9.20	$ 5,326,800
Rip Rap	68,900	TONS	39.00	$ 2,687,100
Rip Rap Bedding	34,500	TONS	32.50	$ 1,121,250
Subtotal				**$ 18,974,950**
Bacon Island @ Santa Fe Cut				
Mobilization and Demobilization	1	JOB	LUMP SUM	$ 1,389,000
Dewatering	1	JOB	LUMP SUM	$ 1,305,000
Sheet Piling	1	JOB	LUMP SUM	$ 4,007,000
Excavation	294,000	CY	6.40	$ 1,881,600
Embankment	356,000	CY	9.20	$ 3,275,200
Rip Rap	61,400	TONS	39.00	$ 2,394,600
Rip Rap Bedding	30,700	TONS	32.50	$ 997,750
Subtotal				**$ 15,250,150**
Subtotal (without contingency)				**$ 71,167,900**
Say				**$ 71,200,000**